

III. *A Second Letter to Dr. Rutty, R. S. Secr. containing farther Observations towards composing a natural History of Mines and Metals. By Dr. Nichols, Præl. Anat. Oxon, and R. S. S.*

Dear S I R,

IN my last I acquainted you with some Particulars relating to Mines in general, and that the Loads in *Cornwal* yielded Iron, Tin, Lead, and Copper.

Of I R O N.

Of all the Substances concurring to form the terrestrial Globe, Iron probably bears the greatest Share; as it not only abounds in most Kinds of Stone, shewing it self in Varieties of Crocus, all which gain a more intense Colour by Fire; but enters likewise greatly into the Composition of common Clay; as may be judged from the Similitude of Colour between Clay and dry Iron Oar; from the easy Vitrification of Clay; from the Resemblance between Clay so vitrify'd and the Clinkers of Iron; from its deep red Colour after Calcination; and lastly, from its yielding pure Iron, by being burned with Oil.

But while Iron is thus entangled with other Bodies, it rarely employs the Care of the Miner; who finds the Expence of reducing it to Metal too seldom balanced by the Price it yields: For which Reason, tho' we frequently meet with large and rich Loads of Iron,
yet

yet (the Woods having been apply'd to more advantageous Uses) they are there entirely neglected.

When it is most pure, I find the Oar under three different Appearances.

Paper the first contains a Piece of rich dry Iron Oar, whose Scrapings exactly resemble an *Alkohol Martis*: This Kind of Iron Oar has very nearly the Colour of common Clay.

Paper the second contains a Piece of rich Iron Oar, with Part of the Wall of the Load formed by a Concretion of yellow Crytals. In this Stone the Iron radiates from Points forming Segments of Spheres, and where these Spheres leave any Interstices, you will find a Crocus, or Oker.

Paper the third contains a Stone of Iron of the Kind used for burnishing Plate; it is of the Species of the *Hematites*.

Both these last Stones scrape into a deep Crocus.

From the second Instance we may conjecture, that the yellow Colour in Crytals arises from a Crocus entangled with the stoney Salts.

Though the Want of Wood in *Cornwal* deprives it of the Advantages it might otherways reap from Iron as a Metal, we shall nevertheless find it far from being a useless Oar, when we consider it as sometimes impregnating the Waters with vitriolick Salts, thereby making them a proper Menstruum for dissolving the disseminated Particles of Metals; sometimes destroying the sulphureous Menstrua, which (tho' they dissolve the disseminated Metals) do nevertheless obstruct their new Concretions; and sometimes as being it self the Magnet by which the metallick Particles are attracted into new Concretions.

Of T I N.

The next metallick Substance found in *Cornwal*, and from which these Islands are supposed to take their Name, is *Tin*. It is never found but as an Oar; whereas Gold is never found but as a Metal, at least its Oar is unknown, and all other Metals are found sometimes as a Metal, and sometimes as an Oar.

Tin always shoots into Crytals which are of different Magnitudes from two Ounces in a single Crystal to such as escape our Sight. These Crytals are for the most Part interspersed in Loads of other Substances.

Paper the fourth contains Tin Crytals interspersed in a Load of a Kind of Clay, in which is observable a considerable Quantity of Red-oker.

Paper the fifth contains a Stone of hard Iron-Stone, in which are exceeding small Crytals of Tin.

Paper the sixth contains somewhat larger Crytals, interspersed in a dry Red-oker.

Paper the seventh contains Tin Crytals, interspersed with Sparr-stone and a Sort of Marl.

Paper the eighth contains larger Crytals, interspersed in a Kind of Clay and Red-oker, as in Paper the fourth.

When a hundred Sacks of the Load (each containing more than a *Winchester* Bushel) yield one Gallon of clean Oar, the Load is esteemed very well worth working.

Sometimes these Crytals are so collected into one Mass, as to form Loads of pure Tin Oar, and so large as to yield to the Value of 100*l.* every twenty-four Hours.

Paper the ninth contains two Stones of such pure Leads, in which observe the one is black, and the other nearly white.

These Crystals concrete sometimes into the Form of a Parallelepipedon, whose Summit is covered by a Pyramid; sometimes the Angles formed by the Sides of the Pyramid, and sometimes the Summit of the Pyramid are as it were plained away.

Paper the tenth contains several of these Crystals, of which Number the first contains a whole Crystal, which has none of its Angles off. (*See Plate the 2d. Fig. the 8th.*). The second contains a Crystal which has only two of its Angles plained away. (*Fig. the 9th.*). The third contains a Crystal which has all its Angles plained away. (*Fig. the 10th.*). The fourth contains a Crystal which has all its Angles and its Summit plained away. (*Fig. the 11th.*)

Sometimes the Crystals represent two equal pentagonal Pyramids joined at their Base,

As in Paper the eleventh, which contains two Clusters of Crystals, which considered separately are of that Form.

Under whatsoever Form these Crystals shoot, they always carry an exceeding fine Surface; which, when rubbed off, can be renewed by no Art. In Paper the fourth one Side of the Parallelepipedon is rubbed away, to shew its Appearance after losing its natural Surface.

These Crystals are of different Colours from the White (like white Sugar candy'd) to the deep Black. Thus Paper the twelfth contains a groupe of small white Tin Crystals, which are very uncommon. These white Crystals seem to me to carry a finer Lustre than any other I ever saw, and are perfectly transparent; so

that were they found of equal Size with the black Cryftals, and of a white Water (which I imagine may be) their Hardnefs and Weight (in both which they exceed any other Foffil) would probably make them preferable to the Diamond. However, as the deeper Colours of thefe Cryftals feems to arife from a greater Proportion of Iron in their Composition, which they throw off in an Iron Slag upon Fufion, and which changes by proper Degrees of Heat into a Crocus, thereby changing the Colour of the Cryftal to a brighter Red; fo the white Tin Oar is certainly to be efteemed both richeft and beft, as moft free from Iron.

Paper the thirteenth contains a Piece of the Load contained in Paper the feventh, in which the Cryftals are of a brighter red, from its being heated red-hot. *(Thefe Specimens were all produced before the Society, and are fince prefented to Sir Hans Sloane, Prefident.)*

Thefe Cryftals feem to be the heaviest Bodies the Earth produces, except Quickfilver and actual Metals. Their fpecifick Gravity is to Water as $90\frac{1}{2}$ to 10; to Rock Cryftal in Water as $90\frac{1}{2}$ to 26; to Diamond as $90\frac{1}{2}$ to 34; and to pure malleable Tin, as found by repeated Trials, as $90\frac{1}{2}$ to 78; from whence appears the Poffibility of what fome Miners affirm, *viz.* That a cubical Inch of fome Tin Oars, will yield more than a cubical Inch of Metal.

Having already taken Notice that the Cryftals of Tin are fometimes fo fmall as to efcape the Eye, and fo diffeminated in the Load as not to make above $\frac{1}{1000}$ th, or $\frac{1}{1000}$ Part of the Load, one would naturally imagine it an endless Labour to cleanfe the Oar from fuch a vaft Difproportion of Rubbifh. But the great

specifick Gravity of these Crystals renders the cleaning it less troublesome, and less expensive, than in any other Oar whatever. It requires no more, than that the whole Stuff be stamped to a fine Powder, after which it is washed by a Water, whose Force is so moderated as to wash away only the lightest Parts. This Stamping and Washing is repeated till the Oar is left exceedingly clean, and yields in Metal from $\frac{1}{2}^{\frac{8}{10}}$ to $\frac{1}{2}^{\frac{9}{10}}$ th, according as it is cleansed from the Load, and as it is in its own Nature more or less free from Iron.

Begging Leave to defer the Account of *Lead* and *Copper*, I am

July the 1st.
1728.

Your very humble Servant,

F. Nicholls.

IV. *A Method of raising some exotick Seeds, which have been judged almost impossible to be raised in England, communicated in a Letter to Dr. Douglas, Coll. Med. Soc. honorar. and R. S. S. By Mr. Philip Miller, Gardiner to the Physick-Garden at Chelsea.*

S I R,

According to my Promise, I here send you an Account of the Methods I have taken to raise the *Coco-Nut*, with the Success of each; which hath led

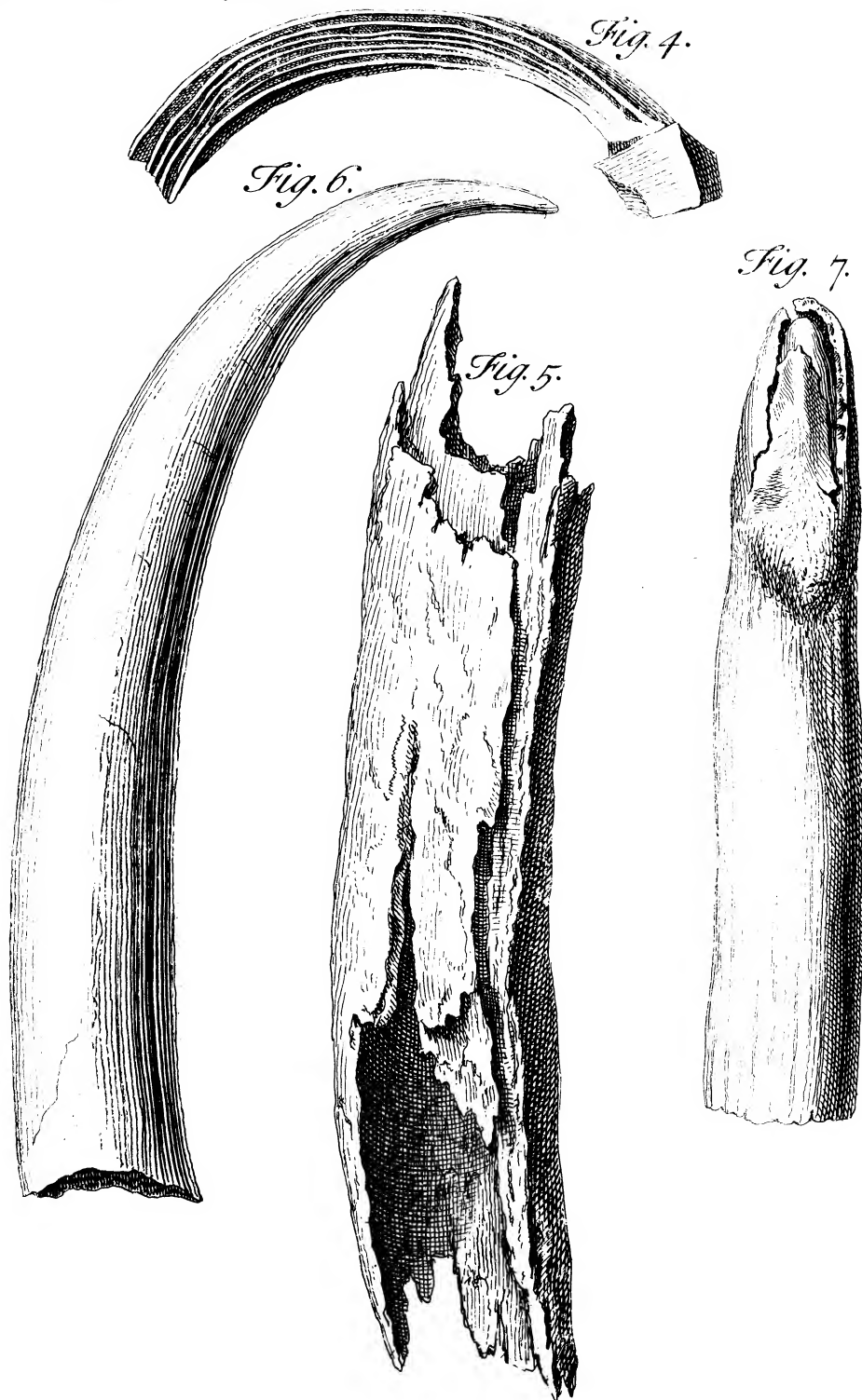


Fig. 8.



Fig. 9.



Fig. 10.



Fig. 11.

